Muelleria 25: 115-128 (2007)

Additions to *Epacris* (Epacridoidae, Ericaceae) in Tasmania

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Abstract

Examination of the "*Epacris tasmanica* Complex", indicates that both major clusters identified in the morphometric analysis of Crowden and Menadue (1990), contain taxonomic units additional to those originally published. Two new species, *E. graniticola* R.K. Crowden and *E. moscalianus* R.K. Crowden have been separated from the *E. virgata* group. A morphometric analysis of the designated *E. tasmanica* component of Cluster B, using floral characters only, has resolved two additional taxa. Taxon 1 is the type of *E. squarrosa* Hook. f., subsequently renamed *E. tasmanica* W.M. Curtis. Taxon 2 is identified as a new species *E. cerasicollina* R.K. Crowden. A new diagnostic key has been prepared which differentiates all currently known taxa within the "*E. tasmanica* Complex".

Introduction

The "*Epacris tasmanica* Complex" (Jarman and Crowden 1977; Crowden and Menadue 1990), comprises a group of Tasmanian *Epacris* species which share the common floristic characters of "corolla tube +/- campanulate and about equal in length to the sepals, anthers exserted above the plane of the corolla lobes" and "long styles with varying degrees of basal swelling, which position the stigmas at the top of or above the anthers".

Within the group definitive separation of five species (*E. acuminata* Benth., *E. barbata* Melville, *E exserta* R. Br., *E. glabella* S.J. Jarman and *E. stuartii* Stapf) is relatively straightforward because their respective morphologies feature at least one character which will permit of their unambiguous identification. However, the other two species (*E. tasmanica* W.M. Curtis and *E. virgata* Hook. f.) have long been regarded as problematical because of their variable and partially overlapping morphologies.

Over recent years, the reported range of occurrence of *E. virgata* has expanded from restricted locations around the Asbestos Range (west of the Tamar River in northern Tasmania) to include new sites east of the Tamar River as well as a number of locations in southern Tasmania. Earlier botanists had known of and had commented on the disjunct distribution of *E. virgata*, Hooker (1860) citing the distribution as "Asbestos hills, Yorktown, and "between Hobarton and Huon, *Gunn*". Despite this, the southern populations were included in *E. squarrosa* Hook. f. in the Floras of Rodway (1903) and Curtis (1962). *E. squarrosa* was later determined as an invalid name and emended by Curtis (1969) to *E. tasmanica* W.M. Curtis.

A morphometric study carried out by Crowden and Menadue (1990), involving 37 populations of the "*Epacris tasmanica* Complex" yielded two major clusters. *Epacris tasmanica* Cluster A integrated all northern and southern populations nominated as *E. virgata,* on the basis of which an emended description for *E. virgata* was prepared. Cluster A also contained *E. stuartii* and an unidentified taxon, *E.* aff. *exserta* Mt Cameron, and was bordered by a minor group containing *E. glabella. Epacris* aff. *exserta* Mt Cameron is now considered to be a new species and is discussed further below. *E. tasmanica* Cluster B was made up of *E. tasmanica* W.M. Curtis (excepting the southern populations of *E. virgata*), plus *E. barbata* and a minor group containing *E. exserta.*

A later study of pollen exine ornamentation in *Epacris* by Menadue and Crowden (1991) separated populations of the "*E. tasmanica* Complex" into the same two groups, in

that the pollens of all *E. tasmanica* Cluster A and related forms are heavily warted, whilst pollens of *E. tasmanica* Cluster B forms have minimal warting or are entirely without exine ornamentation.

A genetic study involving most of the populations studied by Crowden and Menadue (1990) carried out by Gilmour *et al.* (2000), grouped populations in tight clusters according to their close geographic proximity. Populations identified as *E. virgata* by Crowden and Menadue (*E. tasmanica* Cluster A, in part) were separated into northern (Asbestos Range) and southern (Margate-Kettering) sub-groups. However, this genetic variation is not manifest in any corresponding morphological differences which would enable visual separation of these taxa. Accordingly the suggestion by Crowden and Menadue (1990) that all southern populations be included in *E. virgata* is confirmed and their emended description for *E. virgata* is adhered to.

The study by Gilmour et *al.* (2000) also separated the populations in *E. tasmanica* Cluster B identified as *E. tasmanica* by Crowden and Menadue (1990) into two sub-groups (Taxon 1 and Taxon 2). The more southerly sub-group (Taxon 1), occurs patchily in the Spring Bay area (Fig.4 a). The populations close to Triabunna, Orford and in the foothills of the Thumbs Range are unusual amongst all other members of the *"Epacris tasmanica* Complex" in that they are autumn – early winter flowering. The remaining populations extend south patchily into the Forestier Peninsula and inland into the Prosser River Valley towards Buckland and Hospital Creek. All are morphologically similar, and are indistinguishable from the Spring Bay plants except that they are late winter - spring flowering. Taxon 1 identifies with the collection made by R. Gunn No. 1205 (autumn flowering) which is the type specimen for *E. squarrosa* Hook.f., now *E. tasmanica* W.M. Curtis (in part), an emended description for which is given below.

The second sub-group defined by Gilmour *et al.* (2000) (Taxon 2), includes populations from the central east coast, around Cranbrook and the neighbouring East Coast Range (Fig. 4b). This taxon extends south to Green Hills/Hermitage and to the north of Bicheno almost to St Marys. Inland of the East Coast Range it is found on the western slopes, on the hillsides bordering the valley of the St Pauls River and along the Tooms and Macquarie River valleys. There are also river bank populations along the Swan River and at Harding's Falls (E. Swan River).

Crowden and Menadue (1990) used both leaf and floral variables in their analyses. In both canonical variates and cluster analyses, leaf characters (lamina length, width and length to widest point) were the principal determinants separating the populations into the two major groups, *E. tasmanica* Cluster A (*E. virgata* and related forms) and *E. tasmanica* Cluster B (*E. tasmanica s.str.* and related forms). The same two groups were determined by a discriminant function analysis (DFA) in which lamina length along with two floral characters, filament length and length of the corolla tube, were the main discriminating variables. A second DFA using a suite of floral characters alone, gave a similar result and clearly separated Cluster A from Cluster B, while a DFA using a suite of leaf characters alone misclassified many populations, endorsing the view that non-reproductive plants are difficult to classify. However, none of these analyses indicated a bimodal distribution of populations within *E. tasmanica* Cluster B in accord with Gilmour *et al.* (2000). It is probable that the presence of related taxa in Cluster B additional to Taxon 1 and Taxon 2 obscured any bimodality.

Morphological re-examination and comparison of Taxon 1 and Taxon 2 populations revealed some differences in floral morphology particularly filament length, lobe length, and pedicel length, which although small in scale are nonetheless observable to the unaided eye, and therefore of possible use in identifying the taxa. Accordingly a

new morphometric study using these floral variables has been undertaken, to test their reliability as taxon descriptors and determine their usefulness as characters in a diagnostic key.

Materials and methods

Morphometric examination. A morphometric analysis was undertaken using ten populations of the "E. tasmanica Complex – Cluster B", five each from the Taxon 1 and Taxon 2 sub-groups of Gilmour et al (2000), (Populations 1 – 5 and 6 – 10 respectively from the locations referred to in Appendix 1). A representative specimen from each population is lodged in HO. Six variables were measured using five flowers from each of six plants representing each population (Table 1). All measurements were carried out on freshly opened flowers, before anther dehiscence was completed. Measurements for each plant were averaged and these values used to undertake a one-way analysis of variance and discriminant analysis separating the ten populations. This analysis was undertaken with the DISCRIM procedure of SAS (version 9.1 SAS Institute Inc. Cary, N.C.), 2003. Individual plant scores and population centroids were ordinated on canonical variates 1 and 2. The matrix of Mahalanobis distances amongst the 10 populations derived from this analysis was then subject to UPGMA clustering, using PROC CLUSTER of DAS.

Table 1. Variables determined in the morphometric analysis of components of the "*E. tasmanica* Complex – Cluster B".

PED	Pedicel length measured to the base of the sepals, after dissection of the bracts.
STY	Style length from the base after dissection from the ovary, including the stigma.
COR	The length of the corolla "tube" from the base to the geniculation point of the lobes. This measure includes the length of the fused section of the corolla plus the short basal portion of the lobes which continues as an apparent extension of the fused segment.
LOB	Lobe length from the apex to the geniculation.
FIL	The length of the free part of the filament from the point on the corolla where it ceases coherence to the point of attachment of the anther.
ANT	Length of the anther

Determination of anther exsertion. Anther exsertion is best determined using newly opened flowers, preferably before anther dehiscence is completed, by sighting at right angles across the plane of the corolla lobes (Fig. 1 a,b,c). At this stage of flower maturation the anthers are held in a vertical projection. In older flowers, the dehisced anthers reflex into a horizontal orientation and may weigh down on the lobes forcing them to flatten and widen below the normal geniculation (Fig. 1d). In this way the anthers become more exposed and may give an impression of being more fully exserted thus leading to possible misinterpretation. The difference may not be so apparent when dried specimens are examined due to distortion which may occur during the drying. In these cases a direct comparison of the filament and anther lengths is required.

Figure 1. Anther position in *Epacris*. a. included anthers, *E. unicronulata*; b. half-exserted anthers, *E. cerasicollina*; c. anthers wholly exserted, *E. tasmanica*; d. anthers reflexed after dehiscence, *E. cerasicollina*.

Results and discussion

1. *Epacris tasmanica* forms.

Morphometric analysis. Univariate analysis of differences in floral morphology between *E. tasmanica* Cluster B, taxa 1 and 2 is summarised in Table 2. The main differences (and similarities) are highlighted by ratios of the variables and by F values in the ANOVA. The flowers are of comparable size (flower diameter and corolla tube length), although the lobes of *E. tasmanica* are slightly longer and more spreading than Taxon 2. The pedicels (Taxon 2) are longer, almost as long as the subtending leaves (barely longer than the petiole in *E. tasmanica*), and curved (straight in *E. tasmanica*). Most noticeable, however, is the difference in filament length (barely half the size of the anthers in Taxon 2, as long or longer in *E. tasmanica*) in consequence of which in Taxon 2, only the top part of the anthers are exserted above the plane of the corolla lobes, Fig. 1b, (fully exserted in *E tasmanica*, Fig. 1c). Although the differences are of the order of only 1 mm or less and in absolute terms barely discernable to the naked eye, they are nonetheless easy to observe in the comparative context of the morphology of the respective flowers. The difference in anther exsertion especially is readily apparent (Fig. 1b, e) and provides a ready means of identifying Taxon 2 from *E. tasmanica*.

Table 2. Univariate analysis of differences in floral morphology between *E. tasmanica* (Taxon 1) and *E. cerasicollina* (Taxon 2). Means, standard deviations, and ratios (Taxon 1/Taxon 2) of the measured variables are given for the respective combined populations. F and probability values from analysis of variance (ANOVA) are also shown. All measurements in mms.

VARIABLE	TAXON 1 n=30		TAXON 2 n=29		RATIO	ANOVA	
	Mean	SD	Mean	SD	Taxon 1/Taxon 2	F value	Prob.
PED	2.15	0.283	3.31	0.448	0.65	143.5	0.0000
COR	3.24	0.238	3.10	0.423	1.04	2.5	0.1224
LOB	4.17	0.425	3.68	0.358	1.13	22.7	0.0000
FIL	1.34	0.174	0.81	0.096	1.66	208.5	0.0000
ANT	1.21	0.216	1.33	0.257	0.91	4.0	0.0491
STY	3.97	0.262	3.53	0.457	1.13	21.1	0.0000
CV1	-4.68	1.437	4.84	1.131		797.0	0.0000

The dendrogram shown in Fig. 2 is derived from UPGMA cluster analysis based on Mahalanobis distance between populations and Fig. 3 plots population scores on canonical variates 1 (62%) and 2 (16%) derived from the variable discriminant analysis. Both Figs. 2 and 3 clearly show the bimodal grouping of the populations in accordance with their geographical distributions (Fig. 4a, b) as reported by Gilmour *et al.* (2000). Again the two characters, filament and pedicel lengths, predominate in the separation of the groups.

It is proposed to recognise Taxon 2 as a new species given the name *E. cerasicollina*.

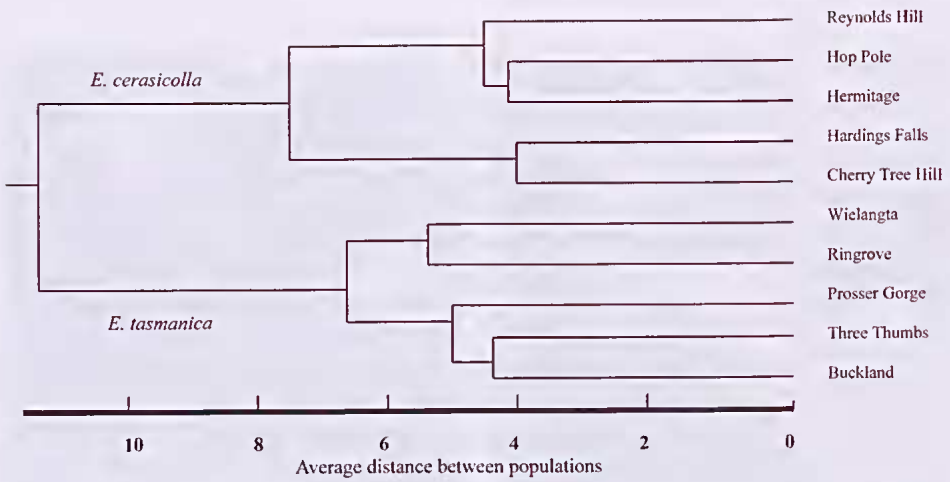


Figure 2. Dendrogram derived from UPGMA cluster analysis based on the Mahalanobis distance between populations.

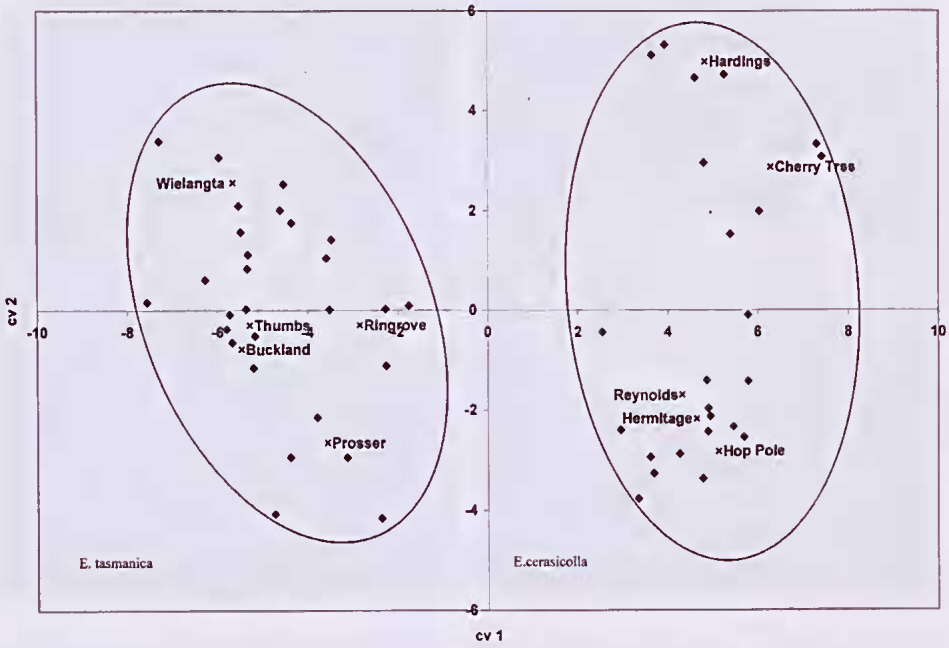
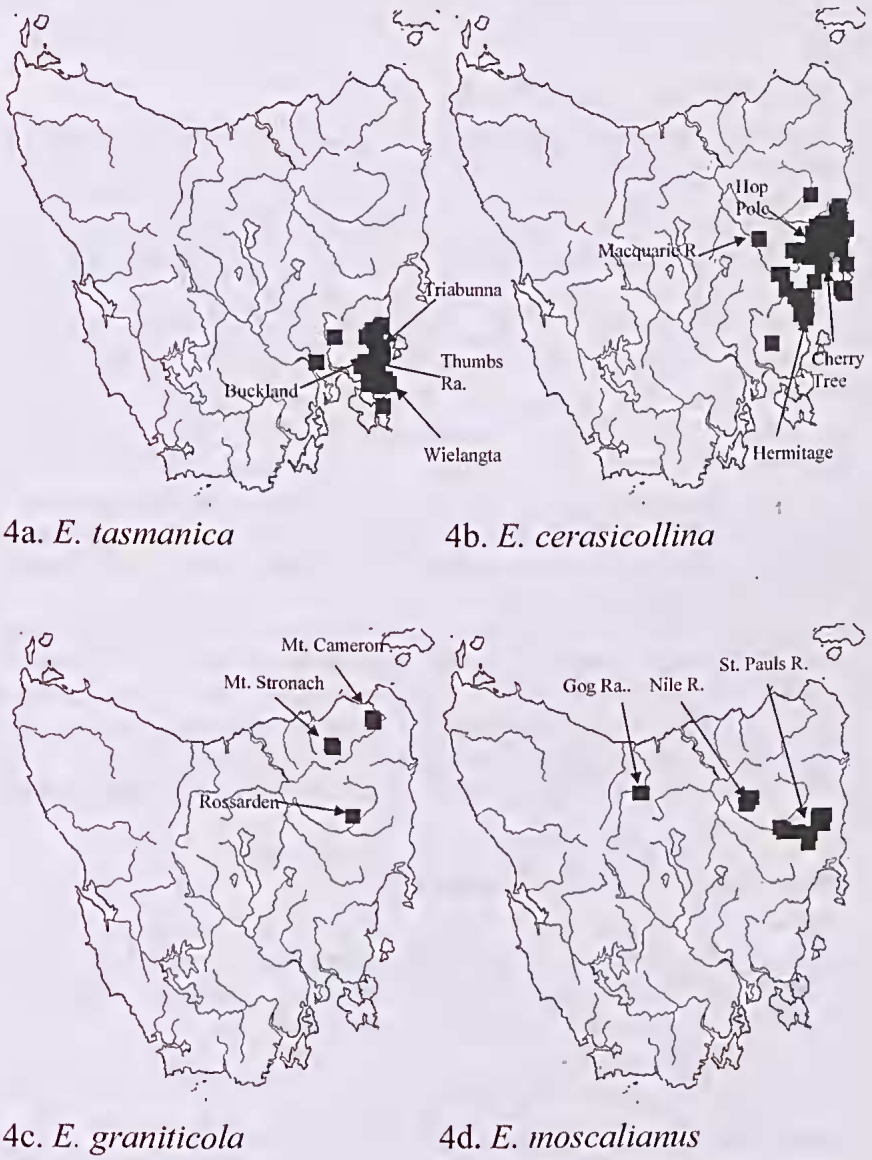


Figure 3. Plot of population scores on canonical variates 1 (62%) and 2 (16%) derived from the variable discriminant analysis. Individual plant scores (♦), population centroids (x).

2. *Epacris virgata* forms.

a. *E. graniticola* R.K. Crowden sp. nov.

From their study Menadue and Crowden (1990) concluded that specimens collected from Mt Cameron (northeast Tasmania), originally designated *E.* aff. *exserta*, were best regarded as an outlying population of *E. virgata*. They recognised that this taxon warranted more study and accordingly did not include it in their emended description of *E. virgata*. Since then the Mt Cameron taxon has been found at two other locations in northeast Tasmania



4a. *E. tasmanica* 4b. *E. cerasicollina*

4c. *E. graniticola* 4d. *E. moscalianus*

Figure 4. Distribution of *Epacris* species: a. *E. tasmanica*, b. *E. cerasicollina*, c. *E. graniticola*, d. *E. moscalianus*, showing some prime locations.

(Mt Stronach and Rossarden, Fig. 4c). Like Mt Cameron these locations provide granite outcrops, on which the plants are found most frequently growing amongst clumps of moss and lichen in moist depressions and fissures on exposed rock platforms. Gilmour *et al.* (2000) provided genetic evidence that the Mt Cameron plants represented a well-differentiated population. After morphological examination of further specimens from Mt Cameron as well as from the new locations, this taxon is now determined to be a separate species for which the name *E. graniticola* is proposed. It can be distinguished from *E. virgata* by its larger, mostly recurved leaves with a thickened and scabrous margin, and by the flowers which are arranged in short, dense terminal clusters (rarely extending more than a few cms. down the branches) rather than the lengthy, open spicate arrangements typical of *E. virgata.*

b. *E. moscalianus* R.K. Crowden sp. nov.

New forestry roads in eastern and northern Tasmania have facilitated access to areas which previously had been rarely visited, resulting in collections of a novel *Epacris* taxon with obvious affinity to *E. virgata.* This taxon has been collected from amongst moss and lichen in crevices or seepage zones on otherwise exposed rock platforms near marshes which feed into the St Pauls River. It is also found along the margins of the outflow creeks and on flood plains continuing down the St Pauls River (Fig. 4d). Earlier collections from the Nile River, upstream of the Lilyburn Bridge and the lower reaches of the St Pauls River, which previously have been designated as *E. exserta* or as riverine forms of *E. virgata* or *E. tasmanica* are now included in this taxon. It has also been collected on rock platform seepages on the Gog Range (Central North Tasmania), from where it occasionally extends down to become a riverbank species on the Mersey River.

Only two populations were available at the time and included in the morphometric study of Menadue and Crowden (1990). Both were from the lower St Pauls River, and both were resolved in the "*E. tasmanica* A" (*E. virgata*) cluster. Unfortunately no populations were included in the genetic study by Gilmour *et al.* (2000).

The taxon is distinguished from *E. virgata* by the clustering of the flowers at the branch tips and by its generally smaller, thickened leaves, mostly less than 3mm long, with mieroserrulate margins and a pronounced, almost keeled midrib; from *E. exserta* by its smaller, ovate to rounded, shortly mueronate leaves, (lanceolate to elliptic, usually > 5mm long, apex obtuse and generally inturned in *E. exserta*); and from *E. graniticola* by its smaller, flat leaves (recurved in *E. graniticola*). The name *E. moscalianus* is proposed for this taxon.

Key to species of the "*E. tasmanica* complex"

This group of species is defined as follows: *Corolla tube +/- campanulate, about equal in length with or slighter shorter than the sepals and the lobes. Anthers exserted either in major part or wholly above the plane of the corolla lobes. Style long, swollen near the base, the stigma at the top of the anthers or exserted beyond them.*

1. Leaf apex attenuate, pungent.....2
   Leaf apex acute or rounded or mucronate, blunt.....6
2. Filaments shorter than the anthers, usually only the top half of the anthers exserted above the plane of the corolla lobes.....3
   Filaments longer than the anthers which are wholly exserted above the lobes.....4

3. Sepals and bracts glabrous. ..... ***E. cerasicollina***
   Sepals and bracts hirsute. ..... ***E. barbata***
4. Leaf base broadly obtuse or rarely cordate, lamina concave and stem clasping near the base, straight and +/- spreading above. ..... ***E. acuminata***
   Leaf base narrowly obtuse or truncate, the lamina +/- flat or slightly concave but not stem clasping, spreading. 5
5. Leaves lanceolate, recurved in the upper part. Plant widespread in the south-east..... ***E. tasmanica***
   Leaves elliptic-ovate to obovate, flat, the apex barely pungent. Plant of limited occurrence at Southport Bluff. ..... ***E. stuartii***
6. Leaves elliptic-lanceolate or narrow oblong, 6mm or longer, the apex a blunt, usually inturned mucro. ..... ***E. exserta***
   Leaves lanceolate-ovate, ovate, rounded or obovate, mostly less than 5mm, the apex a short, blunt mucro.....7
7. Flowers typically in long, open, spicate arrangements extending for many cms down the main stems and branches, or more rarely in denser clusters at the ends of the minor branches.....***E. virgata***
   Flowers clustered at the tips of the main stems or on short axillary branches, or sometimes overlapping in short spike like runs of several cms. 8
8. Lamina 3 – 5mm long, recurved, with thickened scabrous margins..... ***E. graniticola***
   Lamina usually less than 4mm long, flat, straight, margins +/- entire or mieroserrulate.....9
9. Young stems and branchlets glabrous. Midrib only evident abaxially. Plant of limited occurrence in 3 known locations of the west coast ..... ***E. glabella***
   Young stems and branchlets with sparse hairs or hirsute. 3 – 5 veins evident abaxially, the midrib almost keeled. Distribution restricted in the north and northeast. ..... ***E. moscaliauus***

Taxonomy

1. ***Epacris tasmanica*** W.M. Curtis, Taxon 18(2) 244 (1969). emended description.

E. squarrosa Hook. f. non (R. Br.) Poir; *E. serpyllifolia* R. Br. var. *squarrosa* (Hook. f.) Benth.

Lectotype: Chosen by Crowden and Menadue (1990, p. 262). *R. C. Gunn 1209*, Oyster Bay, East Coast (K! NSW!). Residual *syntype R. C. Gunn 1205,* Spring Bay, East Coast, April 1840 (K! NSW!).

Erect sparsely branched *shrub* reaching 2.0m in height, but usually < 1m; young stems and branchlets brown with sparse to dense hairs, older stems mostly bare of leaves. *Leaves* spreading, somewhat crowded on new season's wood, on pubescent, semi-appressed, short petioles < 0.5mm; lamina glabrous or with sparse hairs extending from the petiole, slightly concave, reflexed in upper part, lanceolate to lanceolate-elliptic, 3.0 – 8mm long, 2.0 – 3.5mm wide; apex acute tapering to a pungent mucro; margins entire or irregularly crenulate or scabrid; the midrib keeled, 1, 3 – (5) veins evident abaxially. *Flowers* white on short 1.0 – 2.8mm, straight pedicels, erect, mostly clustered towards the ends or extending a short distance down the branches; bracts creamy white, glabrous, ovate, the lower ones with a rounded apex, the upper ones more acute, margins ciliolate; sepals pale or pink striated, glabrous (rarely hirsute, Bangor and Prosser Gorge), lanceolate-ovate,

3 – 7mm as long as or slightly longer than the corolla tube, the apex acute sometimes almost acuminate, margin ciliolate; corolla tube campanulate, caduceous, 2.5 – 5mm long; lobes spreading, somewhat wavy, longer than the tube 3.5 – 5.5mm long, the bases often cordate, overlapping; anthers red, 0.9 – 1.6mm long wholly exserted above the plane of the corolla lobes on long filaments 1.2 –1.8mm long; ovary smooth, round, glabrous, ca. 1.0mm high; style 3.5 – 6.0mm long, glabrous, distinctly bulbous in the lower half; stigma capitate, exserted; hypogynous scales truncate ca. ¼ depth of ovary. *Capsule* green, usually < ½ length of sepals, the dry sepals and capsule segments open only minimally when the capsules ripen, the style persistent (Fig. 1c, 5)

Selected specimens examined. Ringrove, March 30, 1991, *Y. Menadue* HO 40771. Turnoff to Two Thumbs Lookout, July 14, 1995, *A.C. Rozenfelds* HO 316259. Jacobs Hill, Mt. Walter July 11, 1988, *F. Duncan* HO 326581. Dunbabin property, road to Blackman Bay, Aug. 21, 1996, *M. Ilowski* HO 321580. Burden Razorback, N. of Kellevie, Oct 31, 1983, *A. Moscal* HO 114943. Hospital Creek Reserve, Nov. 13, 1984, *R.K. Crowden*, HO 111581. Paradise Gorge, Prosser River, Sept. 26, 1996, HO 320343. Tasman Hwy. 8.2km east of Buckland, Sept. 12 1984, HO 111582. Orford, Aug. 20, 1952, *W.M. Curtis* HO 5256. Humper Bluff, Forestier Penin. Sept. 12, 1997, *A. Moscal* HO 327 619. Maclaines Heath, Spring Bay, Triabunna, Sept. 10, 1951, *W.M. Curtis* HO 5259. NE slopes of Isles Tier, 4 km NW of Kellevie, Sept. 5, 1982, *A. Moscal* HO 56163. Brown Mt. Forest Reserve, Dec. 18, 1996. *A.J. North* HO 321948.

Distribution: Southeast Tasmania at low altitudes Forestier Peninsula, Spring Bay and inland to the Meehan Range. Open woodlands (*Eucalyptus ovata* and *E. pulchella*) and scrub on shallow stony soils, Fig. 4a.

2. ***Epacris cerasicollina*** R. K. Crowden. sp. nov.

Epacridi tasmanicae habitu et proprietatibus vegetativis similis sed pedicella longiore recurvatoque antheris partim inclusis differt.

Type: **TASMANIA:** Swan River, Waters Meeting, silty banks below ford. Oct.18, 1987, *R.K. Crowden* and *Y. Menadue* (holotype HO 111579). *Iso.* MEL, CANB, NSW.

Shrub of several stiff, erect stems, 0.5 – 1.5 –(2)m high; old stems mostly bare of leaves; young stems rounded, hirsute; *leaves* semi-erect, generally crowded on new wood at the branch tips; lanceolate to ovate-lanceolate, reflexed in upper part, 3 - 8mm long, 2 – 4mm wide, apex attenuate and pungent, base narrowly obtuse tapering into petiole, margins +/- entire or irregularly crenulate or scabrid, lamina sl. coneave near the base, midrib prominent with 3 –(5) veins abaxially, petiole < 1mm, pubescent, the hairs extending onto the base of the lamina. *Flowers* white, in small tight clusters at the branch tips, although rarely extending in tight overlapping spikes a short distance (up to 10cm) down some lateral branches; pedicel 2.5 – 4mm, slightly curved; bracts pale, ovate, obtuse apex in lower bracts, the upper ones more acute and sometimes reflexed, glabrous, ciliolate margins; sepals pale or pink striate, lanceolate to lanceolate-ovate, apex acute or acuminate, sometimes reflexed particularly in some southern populations (eg. near Hermitage and Green Hills), margin ciliolate; corolla tube slightly campanulate, 2.9 – 4.1mm long, the lobes slightly longer and overlapping at the base, apex obtuse; corolla caduceus: anthers red 1.1 -1.7mm long, longer than the subtending filaments, 0.7 – 1.0mm, so that only the upper part is exserted above the plane of the lobes; ovary smooth, style 3.1 – 4.2mm, bulbous near the base, the stigma at or above the top of the anthers; nectary scales truncate, ca. ¼ depth of ovary; capsule greenish brown, < ½ length of the sepals, the sepals and dry capsule segments open only minimally when the capsule ripens; style persistent (fig 1 b,d, 5).

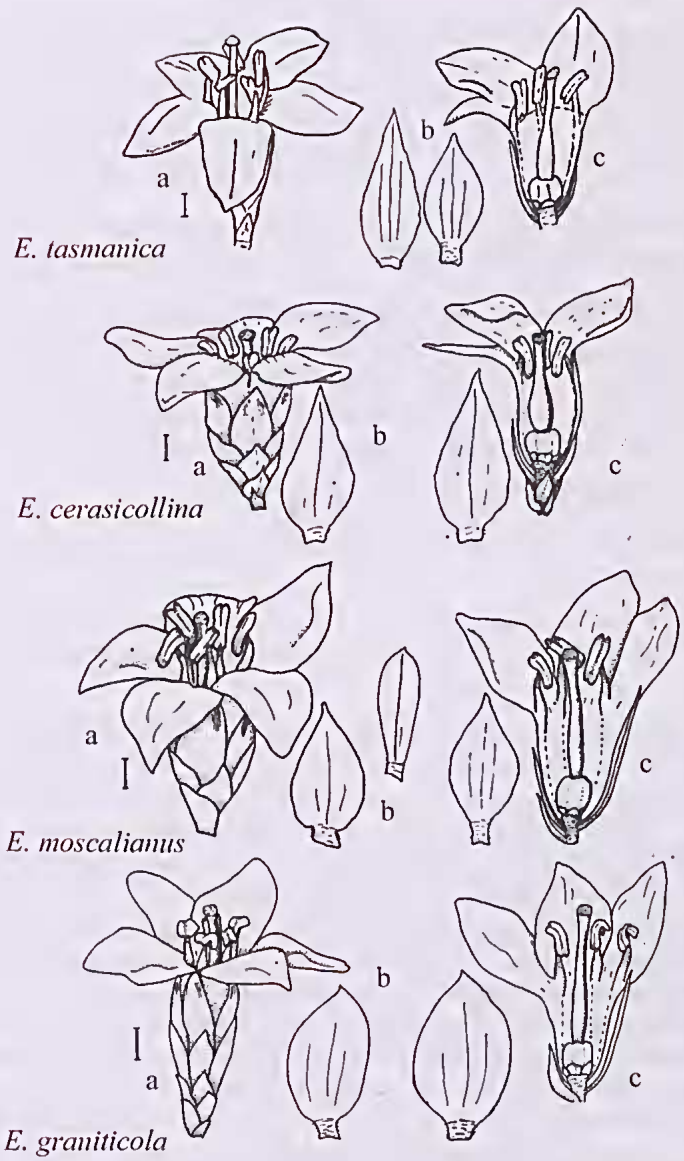


Figure 5. Drawings of *Epacris* species; a. flower, b. leaf variation, c. flower section. Scale bars = 1mm.

Selected specimens examined. Wye River, riverside in rocky site, July 25, 1987, *P. Collier*, HO 120054. Lake leake Rd. 11km from Tasman Hwy. Jn., Nov. 16, 1984, *R.K. Crowden* and *Y. Menadue*, HO 111576. Old Coach Rd. 4.5km NW of Cranbrook, Sept. 12, 1984, *R.K. Crowden* and *Y. Menadue* HO 111567. Old Man Creek, Mayfield Bay, Sept. 12, 1984, *R.K. Crowden* and *Y. Menadue* HO 111574. Lake Leake, Sept. 1, 1983, *W.D. Jackson* HO 68006. Apsley River gorge in river shingle, Nov. 7, 1986, *R.K. Crowden* and *Y. Menadue* HO 407792. Swan R. 6km S of Cranbrook, Sept 4, 1991, *P. Collier* HO 142414. N. of Bicheno, Nov. 18, 1942, *H.D. Gordon* HO 5239. Swansea Oct.15, 1881, *A Simson* HO 5245. Reynolds Hill, Old Coach Road, Oct. 14, 1987, *R.K. Crowden* and *Y. Menadue* HO 111643. Hop Pole Marshes, Sept. 20, 1984, *R.K. Crowden*

and *Y. Menadue* HO 111580. Mt. Peter, east ridge, Dec. 29, 1985, *A.M. Buchanan* HO 98107. Bluemans Creek, Sept.11, 1995, *A. North* HO 316967. Moulting Lagoon game reserve, on track to Apsley marshes, Sept.2, 1996, *D.A. Keith* HO 321579. Schouten Is., S of cabin, Nov. 14, 2000, *A.C. Rozenfelds* HO 509281. Hardings Falls, E. Swan River, Nov. 17, 1985, *R.K. Crowden* and *Y. Menadue* HO 111645. Top of Deep Falls, Green Tier Ridge, SW of Tooms Lake, Oct.14, 1989, *P. Collier* HO 119681. Tasman Hwy 12km N. of Triabunna, Sept. 12, 1984, *R.K. Crowden* HO 407778. Macquarie River, riverbed and terrace, Apr. 30, 2003, A.J. North HO 541045.

Etymology: The specific epithet is from Latin *cerasus*-, cherry, *collis,* hill, named after Cherry Tree Hill, the location of what is possibly its largest extant population.

Distribution: The central east coastal region of Tasmania from Green Hills to about Seymour, on the Freycinet Peninsula and Schouten Island, and inland on the eastern and western slopes of the East Coast range to about 300m altitude, at Lake Leake and down the Valleys of the Tooms and Macquarie Rivers. In grasslands and open woodlands, on shallow stony, often moist soils and in riverbank vegetation. Fig. 4b.

3. ***Epacris granitícola*** R.K. Crowden sp. nov.

Epacride virgata foliis recurvatis marginibus incrassatis scabrisque et floribus in fasciculis terminalibus differt.

Type: **TASMANIA**: Mt. Cameron, southern slopes near eastern end in wet fissures on exposed granite slabs, Oct. 18, 2003, *R.K. Crowden* (holotype: HO 540971). *Iso.* MEL, CANB, NSW.

A generally erect, multistemmed *shrub*, which may reach 1.5m in height in sheltered locations, but often heavily browsed to a low, bushy, almost matlike habit, the old stems mostly bare of leaves. Young stems and branchlets, brown, rounded, hirsute. *Leaves* erect and spreading, reflexed in the upper part; ovate-lanceolate to ovate, 2.0 –5.5mm long, 1.3 – 2.9mm wide; apex acute, mucronate, blunt, the base obtuse and tapering sharply onto the short petiole (< 1mm); lamina glabrous except for sparse hairs extending from the petiole, somewhat thickened; margin thickened, scabrous or minutely denticulate; prominent midrib and 3 – 5 veins evident abaxially. *Flowers* white, in terminal clusters on the main and short lateral branches, or extending a few cms down the major branches; bracts pale, ovate, keeled in the upper part, apex acute, glabrous, margin ciliolate; sepals white or pink striate, lanceolate-ovate, 2.0 – 3.9 mm long, glabrous, apex broadly acute, margin ciliolate; corolla tube barely campanulate, ca. equal to or slightly less than the sepals, glabrous, caducous. anthers red, exserted, 1.0 – 1.45mm long on filaments which are longer; ovary smooth, round, glabrous; style 2.3 -5.8mm long, slender, with a basal swelling, the stigma rounded at the top of or above the anthers; nectary scales rounded triangular, ca. 1/3 the height of the ovary; capsule green, less than ½ sepals length. sepals and dry capsule open widely when the capsules ripen; style persistent (fig 5).

Selected specimens examined. Summit of Mt. Stronach, Aug. 13, 1996, *D.A. Keith* (HO 321358); Mt. Stronach, Oct. 14, 1990, *A. Moscal* (HO 127054); Mt. Cameron, Nov. 19, 1983, *A. Moscal* (HO 110127); Endurance Tin Mine Mt. Cameron, Sept. 05, 1985, *R.K. Crowden* and *Yvonne Menadue* (HO 111595); Cube Rock, Mt. Cameron, Aug. 12, 1996, *D.A. Keith* (HO 321504); Rossarden Sept. 05, 1997, *D.A. Keith* HO 322051).

Etymology: From granite, and Latin *-cola*, dweller. A granite dweller.

Distribution: Known from 3 locations only on granite mountains in northeast Tasmanian; in moist patches on the shaded sides of outcropping boulders or amongst moss and lichen patches in fissures on exposed rock slabs Fig. 4c.

4. ***Epacris moscalianus*** R.K. Crowden sp. nov.

Epacride graniticolae floribus in fasciculis terminalibus similis sed foliis planis rotundatisque, fere carinatis, non nisi costa conspicua abaxialites marginibus serrulatissimis differt.

Type: **TASMANIA:** Dukes River above Dukes Marsh, Nov. 18, 2003, *R.K. Crowden* (holotype HO 541194). *Iso.* MEL, CANB, NSW.

A virgate, sometimes low, bushy *shrub*, rarely more than 50cm high in exposed locations, but reaching up to 1.5m in sheltering scrub; old stems may retain some leaves for several years; young stems greenish-brown, sparsely hairy to pubescent. *Leaves* well spaced on young branches, erect, flat and semi-spreading; 2.1 – 3.5 – (5)mm long, 1.3 – 2.9mm wide, on petioles ca. 1/3 – ½ the length of the leaves, (narrow lanceolate) to oblanceolate to ovate or rounded, the apex broadly acute or obtuse with a short blunt muero, both surfaces glabrous, the midrib very prominent abaxially, margin +/- entire or microserrulate. *Flowers* white, erect, in small, terminal clusters, or rarely extending a few cms down the stems in tight, overlapping spikes; bracts pale or pink tinged, ovate, apex obtuse, margin ciliolate; sepals pink tinged, ovate-lanceolate, ca. equal or slightly longer than the tube, 2.0 – 5mm long, apex acute, margin ciliolate; corolla tube +/- campanulate, 2.0 – 4.7mm long, glabrous, caduceus; lobes longer than the tube, spreading, overlapping slightly at the base, apex rounded; anthers red 1.0 – 1.5mm long, subtended by filaments which are longer and project the anthers well above the plane of the lobes; ovary rounded, smooth, ca. 1/3 of sepals, style slender with a slight basal swelling, 2.5 – 7mm, the stigma exserted usually above the anthers; nectary scales truncate ¼ - 1/3 ovary. *Capsule* green, ca ½ sepal length. Sepals and dry capsule segments open widely when the capsule ripens; style +/- persistent (fig 5).

Selected specimens examined. Royal George, flood plain at St. Pauls River crossing, Oct. 16, 1987, *R.K. Crowden* HO 111720. St. Pauls River gorge, between Mt. Misery and Mt. Puzzler, June 27, 1981, *A. Moscal* HO 44808. St.Pauls River, flood plain gravels at road crossing SE of Avoca, *R.K. Crowden* and *Y. Menadue*, HO 111730. Avoca, Oct. 18, 1881, *A. Simson* HO 514 924. Horshoe Marsh, St. Pauls River, Apr.9, 1980, *A. Moscal* HO 34949. Nile River at Lilyburn Bridge, Aug. 27, 1996, *M. Howski* HO 321506. Dukes River, Nov. 13, 1988, *P. Collier* HO 118675. Gog Range, 2km N of Alum Cliffs, Nov. 9, 2001, *R. Schardinger* HO 526424. St. Pauls River, Jen. With Coal Rivulet, Nov. 22, 1981, *A. Moscal* HO 47233. Coal Rivulet, Nov. 13, 1968, *P. Collier* HO 118683. St. Pauls River, east of Cutoff Hill, May 12, 1985, *P. Collier* HO 98794. West Swan River, Dec. 27, 1980, *A. Moscal* HO 38678. St. Pauls River, riverbed above Meadstone Falls, Nov. 23, 2004, *A.M. Buchanan* HO 530183.

Etymology: Named in honour of Mr Tony Moscal, who first collected this and many other Tasmanian plants during the mid to late 1900's.

Distribution: Marsh edges and outflow creeks to the St Pauls River in eastern Tasmania and as a riverbank and floodplain plant along the St Pauls and upper Nile Rivers; on moist rock outcrops with seepage inflows to some of the above marshes, at Alum Cliffs (Mersey River) on the Gog Range. (Fig 4.d)

Acknowledgements

I thank Prof. B. Potts, School of Plant Science, The University of Tasmania, for running the multivariate programmes; Dr. Y. Menadue for drawings of the *Epacris* species; the staff of the Tasmanian Herbarium for their assistance and encouragement and especially Dr. G. Kantvilas for the Latin.

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Appendix 1.

Locations of populations used in the multivariate analysis.

a. *E. tasmanica.*

1. Wielangta. Roadside scrub at northern edge of Wielangta Forest.
2. Ringrove. Scrubby heath on Sandspit Flats near entrance to Ringrove property.
3. Thumbs. Turnoff to Thumbs Lookout.
4. Prosser. Prosser Gorge below the weir.
5. Buckland. Tasman Highway about 8km east of Buckland.

b. *E. cerasicollina.*

6. Hermitage. Tasman Highway at the turnoff to the Hermitage property.
7. Cherry Tree Hill. Tasman Highway 6km N of Cranbrook, at the entrance to the Forestry Commission's "O" Road.
8. Hardings Falls. In rock crevices and on the riverbank at the head of the falls, Swan River.
9. Reynolds Hill. On the "Old Coach Road, Cranbrook to Avoca, the western slope of the East Coast range about 2km before intersection with the Forestry "M" road.
10. Hop Pole. On the "Old Coach Road", about 5km W of 9, hillside opposite the Hop Pole marshes.